

RAW MATERIALS

UDC 666.122.2(575.1)

KHODZHIKULSKOE QUARTZ SAND AS A NEW RAW MATERIAL

F. A. Mingulova,¹ Z. K. Babaev,¹ M. Yu. Yunusov,¹ and Kh. T. Khakimov¹Translated from *Steklo i Keramika*, No. 8, p. 26, August, 2002.

It is demonstrated that quartz sand from the Khodzhikulscoe deposit is suitable for use in the glass and ceramic industry.

The exhaustion of high-quality material resources requires prospecting for new material varieties. In this context, the kaolinized quartz-feldspar sands from the Khodzhikulscoe deposit located in Karakalpakstan are of special interest.

The kaolinized sands from this deposit are represented by dense light gray and yellowish-white varieties; their chemical composition is indicated in Table 1. The main rock-forming minerals are quartz (40–60%), kaolinite (30–50%), feldspar, muscovite, and sericite. Regarding the granulometric composition, these sands are classified as fine-grained. The content of the main fraction in the sand (0.1–0.5 mm) constitutes 96%. As one goes deeper into the rock layer, the sand content increases and its granulometric composition shifts towards a larger particle size.

The rock components were separated by the gravitation method in a hydrocyclone. One of the products was quartz sand, which had not yet been considered as a material for the glass and ceramic industry.

The sands were investigated at the Laboratory of the Physics of Solids at the Cergy-Pontoise University in France.

The quartz sand is represented by angular and angular-rounded grains (Fig. 1a) of white and milky-white color, oc-

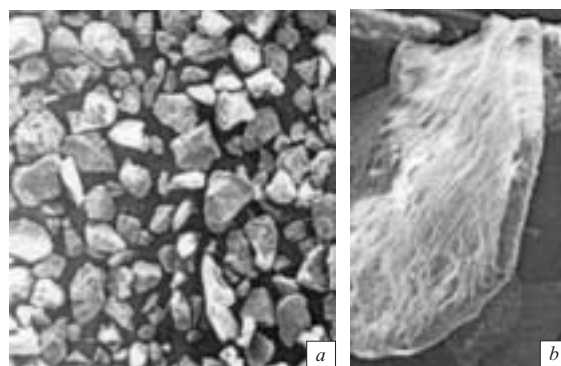


Fig. 1. Electron microscope photos of concentrated quartz sand (*a*, $\times 34$) and of its sulfur-bearing particle (*b*, $\times 302$).

¹ Ministry for Emergency Situations of the Republic of Uzbekistan, Tashkent, Uzbekistan; Tashkent Chemical Engineering Institute, Tashkent, Uzbekistan.

TABLE 1

Material	Weight content, %						
	SiO ₂	Al ₂ O ₃	CaO	MgO	K ₂ O	Na ₂ O	SO ₂
Kaolinized sand*	71.52	15.80	1.32	0.32	0.68	0.71	2.58
Concentrated quartz sand	93.39	1.72	1.18	0.43	1.08	0.55	2.50
Sulfur-bearing particles of quartz sand	6.33	0.65	45.21	0.20	0.23	1.27	46.11

* Apart from that, the sand contains 1.00% Fe₂O₃, 0.51% TiO₂, and 5.60% calcination loss.

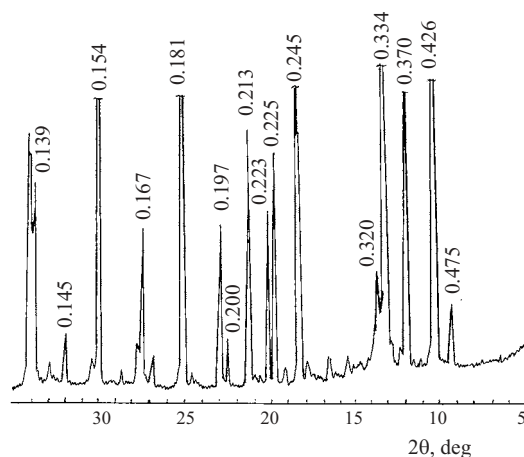


Fig. 2. X-ray pattern of concentrated quartz sand.

casionally nearly transparent. After firing at a temperature of 1300 – 1350°C the sintered cake has a white color virtually without spot defects.

The chemical composition of the sand meets the requirement imposed on the quartz sand for ceramic and glass production. The concentrated quartz sand virtually does not contain colorant oxides; iron and titanium oxides are presumably concentrated in the argillaceous component of the sample.

An x-ray phase analysis of concentrated samples of Khodzhikulskoe quartz sand (Fig. 2) indicated that it is

mainly represented by quartz, whereas feldspar is present in insignificant quantities.

An analysis of the chemical composition of the quartz sand indicated that it contains an increased amount of sulfur. A detailed study of sulfur-bearing particles has been carried out to clarify the nature of sulfate inclusions in the concentrated sand. These particles have a fibrous structure (Fig. 1*b*) and are mostly represented by gypsum dihydrate.

Analysis of the concentrated samples of kaolinized quartz sand from the Khodzhikulskoe deposit demonstrated their suitability for use in glass and ceramic production.